

REPORT
OF
ENGINEER-IN-CHIEF
OF
New York, West Shore & Chicago
RAILROAD.

MAY, 1871.

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ENGINEER'S OFFICE,

NEW YORK, WEST SHORE AND CHICAGO RAILROAD COMPANY,

NEW YORK, *May 15th*, 1871.

To the President and the Board of Directors :

GENTLEMEN,—In reply to your request I have the honor to submit the following statement of the nature of the route, sources of traffic, probable income, and an estimate of cost of your Railroad from New York to Buffalo.

Under your instructions I have estimated your road, when opened to the public, to be one which shall be suitable and proper in all respects for the nature and extent of the traffic that may be anticipated for it.

The object in view, if I correctly interpret your wishes, is the construction of a railroad that shall be the most direct and economical line for the transportation of the rapidly increasing commerce between New York and the West, and over a route with the lowest grades and best alignment.

ROUTE.

For convenience of reference and estimate, I have divided the road into three general divisions : Eastern, Middle, and Western.

THE EASTERN DIVISION,

from Jersey City to Catskill, a distance of 110 miles, lies immediately on the west shore of the Hudson, and has an ascent equal

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to the river tide, of about four feet, and a maximum gradient not exceeding 10 feet per mile.

The curves on this division, the shortest on the whole line, are all within the degree of safety for a high rate of speed, the minimum being near the station at West Point, and of 1,200 feet radius. Unlike the railroad on the opposite side of the river, there are no *reverse* curves or tunnels.

No embankments of any considerable magnitude will have to be raised. The most difficult work to accomplish is the rock excavations; and the most important of these, from the facility with which the excavated material can be disposed of (they being side cuts), can be speedily and economically done.

The streams tributary to the Hudson, on the west side, are few and unimportant, excepting, perhaps, the Rondout and Catskill Creeks. In bridging these streams, draw spans will be required, but no formidable obstacles will be met or extraordinary expenditure necessary.

Materials for masonry, sustaining and protection walls, and ballast, are found in abundance, well distributed along the route, and very easily obtained.

The stratification of the rock on the western shore of the river, lies at a more favorable angle for removal, than on the eastern shore, and consequently, the excavations can be made at less cost.

THE MIDDLE DIVISION,

from Catskill to Syracuse, is 163 miles in length. At the former place the line diverges from the river, or more correctly, the river from this place bears to the eastward, while the route of

the railway continues in almost a direct line to the Mohawk at Schenectady. From thence the route lies along the south side of the Valley of the Mohawk, and of the Erie Canal to Utica; and from this place it continues nearly a direct westerly course to Syracuse.

On this Division the steepest grades of the whole line will be found; from the Hudson, at or near Catskill, to the valley of the Mohawk—a distance of 53 miles—the ascent is 220 feet. The ascents, however, on this portion of the route, can be overcome by grades that will not exceed 30 feet per mile, which will be the maximum of the whole line, and in the direction of the lightest traffic.

The *maximum ascending grade, eastward*, in the direction of the greatest traffic, will not exceed *twenty feet* per mile on any portion of the route, and even this grade occurs but in few places, and for short distances only.

From Schenectady to Utica, the ascent of 193 feet can be accomplished with grades that will not exceed at any place 20 feet per mile.

The barrier that lies between the Atlantic coast and the basin of the Lakes and the Mississippi is passed at Little Falls, between the two last named cities, and at the lowest depression in the Alleghany range of mountains between the St. Lawrence river on the north and the State of Alabama on the south. All the railroads south of your line, extending from the seaboard to the Lakes and Mississippi Valley pass over this range at various elevations. The Erie, at 1,800 feet, with grades of 90 feet per mile; Pennsylvania, at 2,200 feet, with grades of 125 feet; the Baltimore and Ohio, at 2,000 and 2,600 feet, with grades for

fifteen continuous miles of 116 feet, and the Chesapeake, at 2,000 feet, with grades correspondingly high.

The main line of the New York Central Railroad, between the Hudson and Mohawk rivers, has a summit of about 450 feet, which is overcome in either direction by grades of 88 feet per mile.

From Utica to the western end of this division, the character of the grades and work is generally light. Abundance of good materials for the road-bed and foundations are found, and the facilities for delivering them at convenient places of distribution, by water carriage, are excellent.

On the south side of the Mohawk there are found a less number of streams to be bridged than on the north side. The most important is the Schoharie Creek, a stream of no formidable dimensions.

THE WESTERN DIVISION.

From Syracuse to the International Bridge, at Buffalo, the distance is 147 miles, and the route a very favorable one for the construction of your railroad. From Syracuse the line continues almost direct to Buffalo; the Erie Canal and the New York Central Railroad diverging considerably northward at Rochester.

On this division there are found no obstacles greater than those usually encountered over a country of level plains and rolling hills of moderate elevation.

Materials for purposes of construction, including excellent ballast, are abundant, well distributed along the line, and easy of access. At several convenient places, iron, ties, and machinery can be delivered on the line by railroad and canal conveyance.

EASTERN TERMINUS.

I cannot refrain from alluding, here, to the importance and great value to your road, of its eastern terminus. You control a frontage of *twenty-two miles, along the bulkhead line*, of New York Harbor, of the deepest and best protected water, for wharves, on the bay.

At your docks ships can be loaded, directly from the cars, by gravitation, and at a great saving in the expense that now attends the transfer to sea-going vessels, of grain and other produce, brought to this harbor by other railroads, or the river and canal craft—an advantage that no other road terminating on New York bay does, or can, command, and a situation that gives *a value to your route that can scarcely be over-estimated*.

The relative position of this part of the harbor frontage has been regarded, for many years past, by our most sagacious men, as *the key to the inland commerce of this country*, and would long since have been improved, but for the impracticability of constructing a railroad on the west shore of the Hudson, without crossing the grounds of the United States Military Academy of West Point. This the War Department persistently declined to allow, until Congress, in the interests of our rapidly growing inland trade, opened the way, by granting the privilege of constructing a railroad along the shore line of these lands.

All the railroads, terminating on the Hudson, coming from the West and South (excepting the New York Central), approach the river on that side of the harbor, and at right angles to it; consequently they control but a limited amount of dockage, and

through necessity must contribute very largely to the position you command.

On that side of the harbor the English and German steamers have their docks ; there also are the great depots of coal and petroleum, and the extensive cattle yards, to reach which these roads must continue, as now, to pass over your line.

At the foot of the Palisades the river bank varies in width from two to twelve hundred feet, and where it reaches the harbor pier line the water has an average depth of forty-five feet, at low water.

The stone for filling the piers and erecting warehouses lie already quarried at the foot of the Palisades. Granaries and grain elevators can be erected along this line with such facilities for the reception and shipment of grain as cannot fail to secure the entire control of this important branch of trade. The railroad along the head of the docks, with branches down each pier, can deliver and receive the heaviest freight alongside the shipping, thus saving the expense of drayage and storage.

The largest amount of grain and other agricultural produce, as also of coal, arrives at the city and port of New York by the railroads on the west side of the Hudson ; and but a short time only can elapse before the grain elevators and warehouses at the terminus of your road will have stored for shipment the vast products of the West, and the Palisade frontage will be the concentration point of the Western grain trade.

SOURCES OF TRAFFIC.

Uniting, as your road will, on a shorter line with lower grades, the seaboard with the important port at the eastern end of the chain of lakes, on the banks of which are brought annually more than one hundred millions of bushels of grain, and connecting with railroads that gather in the products of three hundred millions of acres of the most fertile territory of the continent, its means of support cannot fail to be largely remunerative.

In addition to the twenty thousand miles of railroad already constructed that would afford a profitable connection with your railroad, it is proper to take into consideration the branch lines and extensions that it would be instrumental in causing to be built, which at a reasonable estimate would, within five years, amount in distance to a length equal to the main line.

Its connections with other roads will not only be numerous, but of itself, it will present the shortest and most economical route for commercial intercourse between the Seaboard and the West.

The sources from whence the through traffic to sustain your road is anticipated, are the broad and fertile fields, and populous towns of States whose aggregate area is over 500,000 square miles, with a population of nearly 7,000,000.

The following statement, taken from the official report of the New York Produce Exchange of January, 1870, will give a better conception of the amount of this commerce :

Aggregate Receipts of Flour and Grain, at Chicago, Milwaukee, Toledo and Cleveland, from January 1st to December 31st, inclusive, for four Years.

	1867.	1868.	1869.	1870.
Flour, bbls.....	3,793,907	4,373,293	5,129,085	4,076,790
Wheat, bush.....	29,565,921	32,105,124	46,012,528	45,220,779
Corn, "	32,198,410	31,619,889	30,171,142	24,967,431
Oats, "	14,205,041	19,563,294	13,454,058	20,747,285
Barley, "	3,014,767	2,685,907	2,302,456	4,711,538
Rye, "	1,171,471	1,790,398	1,384,296	1,343,147
Total Grain.....	80,705,610	87,764,612	93,324,481	96,990,171
Flour to wh't bush...	18,969,535	21,866,465	25,645,425	20,383,950
Grand Total.....	99,675,145	109,631,077	118,969,906	117,374,121

It will be observed that this statement includes only the principal ports, and the article of grain alone.

The development of this branch of commerce, during three decades, preceding 1870, is shown in the following statement, compiled from the official reports of the Board of Trade of Buffalo, of the receipts of grain at that port from 1841 to 1870, inclusive.

Year.	Grain.	Grain, including Flour.	Year.	Grain.	Grain, including Flour.
	Bushels.	Bushels.		Bushels.	Bushels.
1841...	1,852,325	5,592,525	1856	20,123,667	25,753,907
1842...	2,015,928	5,687,468	1857	15,348,930	19,578,695
1843...	2,055,025	6,642,610	1858	20,202,444	26,812,980
1844...	2,335,568	6,910,718	1859	14,429,069	21,530,722
1845...	1,848,040	5,581,790	1860	31,441,440	37,053,115
1846...	6,493,522	13,386,167	1861	50,662,646	61,460,601
1847...	9,868,187	19,153,187	1862	58,642,344	72,872,454
1848...	7,396,012	14,641,012	1863	49,845,065	64,735,510
1849...	8,628,013	14,665,188	1864	41,044,496	51,177,146
1850...	6,618,004	12,059,559	1865	42,473,223	51,415,188
1851...	11,449,661	17,740,781	1866	51,453,833	57,521,548
1852...	13,392,937	20,390,504	1867	43,499,780	50,700,060
1853...	11,078,741	15,956,526	1868	42,436,201	49,949,856
1854...	18,553,455	22,252,235	1869	37,014,728	45,007,163
1855...	19,788,473	24,472,278	1870	39,261,141	46,613,096

COMPARED BY DECADES.			AGGREGATE RECEIPTS COMPARED.		
Year.	Grain.	Grain including Flour.	Decades.	Grain.	Grain, including Flour.
	Bushels.	Bushels.		Bushels.	Bushels.
1840	1,075,888	4,061,598	1840-50.....	49,110,624	104,320,214
1850	6,618,004	12,059,559	1850-60.....	175,808,817	231,541,743
1860	31,441,440	37,053,115	1860-70.....	456,333,457	551,451,622
1870	39,261,141	46,613,096	Total 30 years	781,252,898	1,187,413,579

Increase from 1850 to 1860, 121 per cent.

Increase from 1860 to 1870, 137 per cent. Average, 129.

Should this increase continue in the same ratio for the next decade, the aggregate amount would be, 1,262,824,214 bushels—an average of 126,282,421 bushels per year.

The foregoing includes only the grain received by vessels, and not by rail, as by the latter it is “through freight,” and not transferred at that place.

The total shipments of grain eastward for the year 1870 from Buffalo, was, by canal, 29,430,881 bushels, and by railroad, 29,901,872 bushels.

This amount of grain shipment, large as it is, will be greatly increased under the stimulus of cheaper transportation.

Another important source of traffic is the transportation of Live Stock, as will be seen by the following tabular statement, from the same report.

This traffic is increasing more rapidly than any other, and is a profitable branch of trade. Year by year the Eastern States are becoming more dependent upon the great prairies of the West for their supply of animal food.

*Shipments of Live Stock from Buffalo, by the Erie, and New York Central
Railroads, for the years named, compiled from Official Reports.*

Date.	Cattle.	Sheep.	Hogs.	Horses.	Aggregate.
1860.....	150,972	145,354	85,770	.....	382,096
1861.....	141,629	238,952	110,679	.....	482,260
1862.....	129,433	524,976	105,671	.....	760,070
1863.....	154,789	474,849	91,128	.....	720,766
1864.....	135,797	155,959	301,629	.....	593,385
1865.....	212,839	207,208	300,014	.....	720,061
1866.....	275,091	341,560	552,831	.....	1,169,482
1867.....	257,872	239,943	607,440	3,454	1,108,709
1868.....	265,105	385,815	470,578	7,737	1,129,235
1869.....	347,871	381,450	794,272	12,088	1,535,681
1870.....	388,057	557,447	739,519	7,896	1,651,919

To show the amount of the grain shipments that are destined for this port, as also the variety and amount of other agricultural products that contribute to the maintenance of the railways centering at this city, I append a table of cereal receipts for four years, and a comparative statement of the amounts of leading articles of trade received by rail and water conveyance [compiled from official reports] for each year, ending December 31st.

Receipts of Flour and Grain at New York.

ARTICLES.	1867.	1868.	1869.	1870.
Flour, bbls.....	2,605,849	2,845,986	3,537,539	4,169,933
Wheat, bush.....	9,706,804	12,950,068	23,952,250	23,903,259
Corn, "	15,024,221	18,995,072	10,691,749	9,229,911
Oats, "	8,054,164	10,278,781	8,721,608	9,665,954
Barley, "	2,223,769	2,274,255	2,524,666	3,958,229
Rye, "	748,784	775,612	365,468	557,781
Peas, "	668,457	378,423	116,974	223,649
Malt, "	443,105	514,620	473,988	1,055,119
Total "	36,869,304	46,166,831	46,846,700	48,593,902
Flour to wh't bush..	13,029,245	14,279,930	17,687,695	20,849,665
Grand total.....	49,898,549	60,446,761	64,534,395	69,443,567

Receipts of Produce at New York, for the year ending December 31st, 1870.

ARTICLES.	BY RAILROAD.	BY WATER.		Total, All Routes.
		Vessels Coastwise.	Hudson River Boats.	
Flour, bbls	3,323,407	390,552	455,974	4,169,933
Wheat, bush.....	6,229,456	1,834,615	17,470,505	23,903,259
Corn, "	4,221,637	1,398,009	4,481,851	9,229,911
Oats, "	3,893,774	1,255,201	5,733,377	9,665,954
Barley, "	236,474	298,687	3,423,068	3,958,229
Rye, "	81,519	3,253	473,010	557,781
Malt, "	312,779	22,600	720,340	1,055,119
Peas, "	15,560	.....	182,954	198,514
Seeds, "	87,518	13,566	60	99,146
Ashes, casks.....	6,504	15	467	6,986
Whiskey, bbls.....	175,785	5,444	1,180	182,409
Corn Meal, bbls.....	22,840	35,974	417	59,251
Do. sacks.....	256,006	8,298	.....	264,301
Beef, pkg's.....	75,440	47,152	1,102	123,794
Pork, bbls.....	121,746	782	3,155	125,683
Cut Meats, pkg's	96,059	1,544	13,009	98,912
Lard "	96,682	1,776	275	98,733
Do. k'gs.....	9,425	15,232	435	24,642
Oil Cake, sacks.....	80,193	12,815	10,079	103,086
Dressed Hogs, number	82,333	.....	30,439	112,772

To the casual observer it would seem that the two railroads on opposite banks of the river would be in a very close competition ; but a little reflection and a proper understanding of the situation will dispel this conclusion. Between New York and Albany, a distance of 150 miles, there are but eight steam ferries, an average of one ferry in 18 miles ; and between Schenectady and Utica, a distance of 80 miles, on the Mohawk, there are only eight bridges and one ferry, or about one crossing in nine miles.

During the winter, and especially while the ice is forming and breaking up on the Hudson, there are many days when this river, above New York harbor, is impassable even at these few places.

In point of convenience, the counties on the west side of the Hudson are as far removed from present railroad facilities as though fifteen miles of country intervened.

On the west side of the Hudson, running parallel to it, the direction of the line of travel and traffic, there is not a single railroad, while on the opposite side there are three, and a portion of the way four, railroads, running parallel to each other, and only a few miles distant, and all highly prosperous.

The population that would be accommodated by your line of railroad exceeds by 55 per cent. the number from which the Hudson River Railroad derives their local traffic, and which, from the opening of that road, has been in excess, in value, of the large through passenger travel this road maintains, as may be seen from the following table, compiled from official reports :

Passenger Traffic, Hudson River Railroad.

YEAR.	Number Passengers, all Classes, Carried.	RECEIPTS FROM PASSENGERS.		
		Local.	Through.	Total.
1861.....	1,501,242	\$778,742	\$259,413	\$1,037,655
1862.....	1,456,402	848,381	346,552	1,202,684
1863.....	1,804,812	1,086,065	464,160	1,550,226
1864.....	2,107,843	1,268,042	653,235	1,921,277
1865.....	2,068,245	1,700,214	398,816	2,099,030
1866.....	2,159,267	1,711,156	427,788	2,138,940
1867.....	2,266,743	1,620,640	405,160	2,025,800
1868.....	2,626,303	} No official report. }		2,000,474
1869.....	2,906,703			2,629,938
1870.....	3,107,477	1,418,177	1,115,743	2,533,920

On the west shore are found the most populous and business towns and cities, aggregating a population of 244,306. There can be scarcely a doubt that from the opening of your road a preponderance of local traffic will be found over your line. In ad-

dition to the business that will inure to your railroad from the populous district through which it passes, there are two railroads, passing through the counties to the west, that terminate on your line, and which will find their shortest way, to this city, over your road.

Judging from the fertile sections through which your line is projected, the important towns and cities it passes, and the history of railroads constructed over routes less favorable, I must conclude that the local traffic over your road will be equal to that of the most favored lines in the country.

The population of the counties through which your road passes, now numbers 1,117,981, or 107 to the square mile. They must continue, as in the past, to increase, and at a more rapid rate after the opening of the road. Especially must this be the result in the towns along the river, for there is no equal portion of the country which offers so great inducements to a class, the most profitable to the local business of the road, as the west shore of the Hudson. Its commanding promontories, bluffs, and beautiful slopes, afford the finest views of river and mountain scenery ; and its beautiful bays and inlets, and its fine groves of native shade trees, are its natural attractions. "These are greatly enhanced by its many comfortable dwellings, its excellent roads, its abundant fruit gardens, and cultivated fields. All that is now required to more completely develop this interesting district, and to give greatly increased value to property within its limits, is the convenient means of access to the city which the road will give." The many eligible sites, now unoccupied, would then soon be covered by elegant residences in greater number than on the eastern shore of the river.

The population of the counties bordering on the west shore of the Hudson, according to the late census, is 249,430, or 26,644 greater than the population in the corresponding counties on the eastern shore in 1860, at which time the railroad on that side of the river was earning, from local passengers alone, over three-fourths of a million annually. It is noticeable, also, that while the population of the eastern shore counties have increased in numbers only about 16 per cent. in ten years, the income from local passenger traffic has increased over eighty-two per cent. This disproportion of increment is due to the convenience afforded our city population for country residence.

On the west shore are found the desirable and popular summer resorts of the Palisades, West Point, and the Catskill Mountains. The line also is more direct from New York to the numerous noted springs and fashionable watering-places : Saratoga, Sharon, Clifton, and Avon Springs, and Niagara Falls.

ESTIMATE OF INCOME.

Owing to the formation of the country, and its divisions by intersecting mountain ridges and lakes, no shorter line, with reasonable grades and practicable curves, than that of your road, between the termini, can be found ; hence it will hold permanently the advantage for through traffic.

It can be shown by the following data, that, by a proper adaptation of the rolling stock and machinery of the road to the transportation, grain can, by it, be brought from Buffalo as cheaply as by canal and river navigation at present rates.

The average rate for fourteen years past, by canal and river, for corn, has been \$4.98 per ton, or an average of $1\frac{18}{100}$ cents per ton per mile, for a distance of 420 miles—the length of your line.

The whole tonnage carried over the New York Central and Hudson River Railroads, and the Erie Railway, from 1861 to 1870, inclusive, is 52,793,917—an average of 5,279,391 tons each year.

The following tables, compiled from official reports, will show the tonnage in each year named, the tons moved one mile, and the rates per ton, and the cost per ton per mile for transportation :—

*Freight Tonnage of the New York Central, Hudson River and Erie Railroads,
for the Years named.*

YEAR.	Tons of Freight, Erie Railway.	Tons of Freight, N. Y. C. and H. R. R.	Total.
1861.....	1,253,418	1,512,596	2,776,014
1862.....	1,632,955	1,905,173	3,538,128
1863.....	1,815,096	2,106,571	3,921,667
1864.....	2,170,798	2,158,972	4,329,770
1865.....	2,234,350	1,767,154	4,001,504
1866.....	3,242,792	2,099,504	5,342,296
1867.....	3,484,546	2,249,363	5,733,909
1868.....	3,908,243	2,562,862	6,471,105
1869.....	4,312,209	3,190,810	7,503,019
1870.....	4,852,505	4,324,000	9,176,505
Total 10 years.....	.....	.....	52,793,917 tons.

Average5,279,391 tons.

Average annual increase, 90 per cent.

In ten years, this ratio of increase would equal an annual tonnage of 10,030,842 tons.

Tons of Freight Carried One Mile, Charges per Ton, and Cost of Transportation per Mile.

YEAR.	NEW YORK CENTRAL RAILROAD.			ERIE RAILWAY.		
	Tons Moved One Mile.	Charges, Cents.	Cost, Cents.	Tons Moved One Mile.	Charges, Cents.	Cost, Cents.
1861.....	237,392,974	1.96	1.35	251,350,127	1.73	.....
1862.....	296,963,492	2.22	1.38	351,092,285	1.89	1.06
1863.....	312,195,796	2.40	1.55	403,670,861	2.09	1.12
1864.....	314,081,410	2.75	2.00	422,013,644	2.31	1.57
1865.....	264,993,626	3.31	1.84	388,557,213	2.76	2.15
1866.....	331,075,547	2.92	2.07	478,485,772	2.45	1.62
1867.....	362,180,606	2.52	1.89	549,888,422	2.04	1.47
1868.....	366,199,786	2.59	1.64	595,699,225	1.92	1.34
1869.....	474,419,726	2.24	1.27	817,829,190	1.58	1.17
1870.....	769,087,777	1.88	*	898,862,718	1.48	*

The cost of transportation includes all charges, except for dividends and interest.

The average earnings from freight during the ten years, is $2\frac{24}{100}$ cents per ton per mile, and the average costs allotted to freight, during the nine years given, is $1\frac{32}{100}$ cents per ton per mile.

It is practicable to reduce the weight of trains, exclusive of freight,† to a tonnage that shall not exceed the weight of merchandise carried, which, with the low grades of your road, would increase the capacity of the trains with a given mileage, and the same expenditure of power, 26 per cent.

With a suitable road-bed, and steel rails, a further saving of 12 per cent. may be assumed.

Should this ratio be established, then the practical cost of moving grain by rail from Buffalo to New York Harbor will be less

* A full report for 1870 not yet published.

† The average weight in tons of freight trains, exclusive of freight, for several years on the N. Y. C. R. R., is one hundred and eighty tons. Average tons of freight per train in 1869, one hundred and thirty-two tons.

than $10\frac{1}{2}$ cents per bushel, or, on all fixed heavy articles of freight, such as wheat, flour, live stock, meats, etc., the cost will be $8\frac{1}{10}$ mills per ton, per mile—17 per cent. below the average for 14 years past, of canal* and river transportation for wheat and corn, between the same termini, as shown by the following statement of Mr. E. H. Walker, Statician for the New York Produce Exchange.

Canal Freight on Wheat and Corn from Buffalo to New York, from 1857 to 1870, inclusive.

YEAR.	BUFFALO TO NEW YORK. CANAL AND RIVER.		YEAR.	BUFFALO TO NEW YORK. CANAL AND RIVER.	
	Wheat per bushel, 60 lbs.	Corn per bushel, 56 lbs.		Wheat per bushel, 60 lbs.	Corn per bushel, 56 lbs.
	C. M. F.	C. M. F.		C. M. F.	C. M. F.
1857.....	15 3 9	12 1 4	1864.....	18 7 8	16 5 5
1858.....	12 5 2	10 9 7	1865.....	11 8 4	14 6 7
1859.....	12 8 0	11 1 8	1866.....	17 2 7	14 4 2
1860.....	14 9 4	13 4 3	1867.....	15 6 9	13 3 2
1861.....	15 7 5	14 4 3	1868.....	15 6 5	13 0 1
1862.....	15 8 4	13 7 6	1869.....	16 3 1	13 8 6
1863.....	15 3 9	13 3 9	1870.....	11 2 2	10 3 5
Av. 14 yrs.....				14 9 5	13 2 5

With these advantages, it is quite apparent that your road must stand in advance of the parallel lines westward, and command the through transportation in either direction.

The best conception of the business and income for your road may be drawn from statements of traffic, and earnings of the two trunk lines of railway terminating at this city, and of the total tonnage of these lines, and the Erie Canal—compiled from official reports.

* The distance by canal and river is 500 miles.

New York Central and Hudson River Railroad Tonnage and Receipts from Freight.

Year.	Tons of Freight carried.	Tons Carried One Mile.	Income from Freight.
1861.....	1,512,462	237,392,974	\$5,557,019
1862.....	1,904,173	357,339,135	8,076,449
1863.....	2,106,571	387,387,266	9,462,614
1864.....	2,158,972	386,801,761	10,678,039
1865.....	1,767,154	318,732,070	10,965,399
1866.....	2,099,504	387,620,986	11,999,568
1867.....	2,249,363	435,417,629	11,993,008
1868.....	2,562,862	455,046,715	12,479,950
1869.....	3,190,810	599,362,849	14,066,385
1870.....	4,343,000	769,087,777	14,489,216

Consolidated Earnings of N. Y., C. and H. R. R. R. from 1854 to 1870, inclusive.

Year.	From Passengers.	From Freight.	Mail and Miscellaneous.	Total.
1854.....	\$4,388,817	\$2,943,965	\$339,233	\$7,672,015
1855.....	4,456,199	3,755,316	164,149	8,375,664
1856.....	4,308,853	5,052,659	252,146	9,613,058
1857.....	4,279,956	5,275,876	374,246	9,930,078
1858.....	3,575,513	4,244,639	364,673	8,184,825
1859.....	3,636,032	4,049,530	342,913	8,028,475
1860.....	3,714,203	4,943,733	346,454	9,004,390
1861.....	3,353,587	5,557,019	387,447	9,298,053
1862.....	3,592,408	8,076,449	418,351	12,087,208
1863.....	4,480,567	9,462,614	517,162	14,490,343
1864.....	5,844,428	10,678,039	599,710	17,122,168
1865.....	6,620,484	10,965,399	906,442	18,392,325
1866.....	6,499,192	11,999,568	925,586	19,424,346
1867.....	6,057,823	11,993,008	1,156,614	19,207,445
1868.....	6,064,266	12,479,950	1,360,698	19,904,915
1869.....	6,498,408	14,066,385	1,506,279	22,071,583
1870.....	6,738,592	14,489,216	1,135,511	22,363,319

Erie Railway: Tonnage and Receipts from Freight, from 1854 to 1870, inclusive.

Years.	Tons of Freight.	Tons Moved One Mile.	Income from Freight.
1854.....	743,250	261,616,078	\$3,428,411
1855.....	842,048	150,673,997	3,616,554
1856.....	943,215	183,458,046	4,545,782
1857.....	978,066	167,100,850	4,097,610
1858.....	816,954	165,895,635	3,843,310
1859.....	869,073	147,127,039	3,195,869
1860.....	1,139,554	214,084,395	3,884,343
1861.....	1,253,418	251,350,127	4,351,464
1862.....	1,632,955	351,092,285	6,642,915
1863.....	1,815,096	403,670,861	8,432,234
1864.....	2,170,798	422,013,644	9,855,087
1865.....	2,234,350	388,557,213	10,726,264
1866.....	3,242,792	478,485,772	11,611,023
1867.....	3,484,546	549,888,422	11,204,688
1868.....	3,908,243	595,699,225	11,425,738
1869.....	4,312,209	817,829,190	13,046,803
1870.....	4,852,505	898,862,718	13,328,027

Total Earnings of the Erie Railway, from 1861 to 1870, inclusive.

Year.	From Passengers.	From Freight.	Mail and Miscellaneous.	Total.
1861.....	\$1,136,045	\$4,351,464	\$103,406	\$5,591,915
1862.....	1,200,450	7,065,363	133,521	8,400,334
1863.....	1,850,984	8,476,810	141,687	10,469,481
1864.....	3,002,198	10,242,897	184,584	13,429,643
1865.....	4,401,354	11,926,540	133,334	16,462,228
1866.....	3,148,290	11,261,642	186,481	14,596,413
1867.....	2,931,833	11,204,689	180,691	14,317,213
1868.....	3,531,504	10,638,651	206,717	14,376,872
1869.....	4,043,048	12,583,793	245,068	16,721,500
1870.....	3,166,877	13,328,027	684,557	16,179,461

Comparative Statement of the Total Tonnage Movement over the New York State Canals, New York Central and Hudson River Railroads, and Erie Railway, from 1860 to 1870.

Year.	N. Y. S. Canals. Tons moved one mile.	N. Y. C. & H. R. R. Tons moved one mile.	Erie Railway. Tons moved one mile.	Total Tonnage of Railroads and Canals.
1861.....	863,623,507	237,392,974	251,350,127	1,352,366,608
1862.....	1,123,548,430	357,339,135	351,092,285	1,632,291,531
1863.....	1,034,130,023	387,387,266	403,670,861	1,825,188,150
1864.....	871,335,150	386,801,761	422,013,644	1,580,150,555
1865.....	843,915,779	318,732,070	388,557,213	1,541,205,062
1866.....	1,021,448,034	387,620,986	478,485,772	1,887,554,792
1867.....	958,362,953	435,417,629	549,888,422	2,043,669,004
1868.....	1,033,751,268	455,046,715	595,699,225	2,084,407,208
1869.....	919,153,611	599,362,849	817,829,190	2,336,145,650
1870.....	904,351,572	769,087,777	898,862,718	2,572,302,067

The following table, showing the comparative amount of freight "Eastward" and "Westward," on the Erie Canal, from Buffalo, is compiled from the Reports of the Board of Trade of that city:—

Years.	EASTWARD.	WESTWARD.	Total.
	Tons.	Tons.	
1861.....	1,579,745	293,883	1,819,628
1862.....	1,980,981	353,422	2,334,404
1863.....	1,692,651	426,338	2,118,989
1864.....	1,402,859	461,287	1,864,146
1865.....	1,307,557	439,920	1,747,477
1866.....	1,600,300	589,923	2,290,253
1867.....	1,418,451	557,316	1,975,763
1868.....	1,476,298	682,916	2,159,214
1869.....	1,281,706	506,532	1,788,238
1870.....	1,303,904	633,849	1,937,753

From the foregoing, it will be observed that, while the total tonnage on these lines has increased during the past ten years 90 per cent., the tonnage of the State canals has increased only eleven per cent., and the Main Canal running parallel to the N. Y. C. Railroad has decreased over seventeen per cent., the

railroads named have gained two hundred and twenty-seven per cent.

These are significant facts—one illustrating the inclination of traffic to seek railroad in preference to canal transportation, and the other a tendency to an equalization of freights in each direction; the westward freight having increased one hundred and sixty-four per cent.

If the history of the progress of the two trunk lines of railroad referred to are an indication of the future (and there can scarcely be a doubt but that this increase of traffic will continue for many years to come), the tonnage in 1880, were it possible for the present roads to carry it, would amount to *an aggregate of 21,962,796 tons, and the earnings at the same rate of charge, to \$99,440,372.*

A general estimate of the value of your line when completed, may be drawn from the New York Central and Hudson River Railroads. These roads, now consolidated in one line, have cost, fully equipped, according to the latest published reports (1869), \$54,343,998.

The Capital Stock and Consolidated Certificates

issued, amount to.....	\$89,428,833
Fund and Floating debt.....	13,682,974
Total liabilities,	<u>\$103,111,807</u>

For the year ending September 30, 1870, the total earnings of this road were \$22,363,319; from which was paid \$14,295,054, for transportation charges, taxes, and rents; two dividends of four per cent. each, on \$89,428,823; the interest on a funded debt of \$13,681,807; and \$111,113 to the sinking fund account

—an amount for interest and dividends alone, equal to over *fourteen and a half per cent.* on the *total cost* of the road.

From your road, better results than these may reasonably be anticipated. The economy of a shorter line, better grades, and more perfect alignment and structure, are advantages largely favorable to your line.

On the opening of your road, the aggregate amount of railway earnings between the termini of your line, assuming the future increase to be equal to the past, will amount to \$70,000,000.

It will be fair to assume that your road will secure its equal proportion of the traffic, amounting to \$23,333,333.

Estimating the operating expenses to be the average of American railroads, the net income will be \$9,333,333, or over *eighteen and one-half per cent.* on \$50,000,000.

The railroads first built in this country were experimental; and were devised with no system, and with less reference to trunk lines, than to local convenience; hence, the shortest "through" line, with low grades, was not regarded as of that importance which our present extended area of trade demands. Of this, the New York Central is a notable example; commencing with a short railroad of seventeen miles, from Albany to Schenectady, on which were two inclined planes overcome by stationary power, this experiment was soon followed by the organization of several companies, intent on local convenience, and continued, until a number of short, disconnected railroads, diverging irregularly to reach the principal towns, were in use from Albany to Buffalo.*

* The distance from New York to Buffalo, by the Erie Railway, is 13 miles, and by the New York Central and Hudson River Railroads, 24 miles, more than by the New York, West Shore and Chicago Railroad.

When first opened to use, these roads were comparatively slender structures, and not at all adapted to meet the subsequent demand for heavier trains and greater speed. The original defects have been a fruitful source of embarrassment to the Companies; and, from necessary improvements and changes, have increased largely the cost of their property. An open construction account has been a necessity, until the present charges are extended to an excessive amount, for the character of structures obtained.

The question of running passenger trains, with ordinary safety, at a speed of 50 miles per hour, is already solved on the well-built railways of England. But the high rate of speed obtained on the European railways is not safe or practicable on the railroads of this country, as at present constructed, with short curves, steep grades, and imperfect road-beds and superstructure; nor can they be adapted to such rapid transit without an almost complete reconstruction, and a very large outlay of money.

ESTIMATE OF COST.

The following is an estimate of the cost of constructing your road, on the route described.

The estimate contemplates a double track railroad of 4 feet 8½ inch gauge.

Cuts and embankments, 24 feet wide at grade, with proper slopes.

Masonry, for bridge abutments and culverts, to be laid in hydraulic cement, and to be first class as to durability.

The bridges, to be of wrought-iron, and capable of sustain-

ing, with a factor of safety of six times the stress, locomotives of 30 tons weight, moving at a speed of 50 miles an hour.

Ballast, of broken stone or gravel, laid 12 inches deep, beneath the ties.

Ties, of white oak—6 x 8—8 feet long, and laid not more than 24 inches apart, from centre to centre.

Complete drainage.

Steel rails, weighing 60 pounds per yard, with fish-plate joints, and most approved fastenings.

Station sidings and switches; and a maximum gradient eastward of 20 feet per mile, and westward of 30 feet per mile.

EASTERN DIVISION, 110 MILES.

For completing Graduation, Bridges, and Superstructure, from the Jersey City Ferry to State Line, N. J. (20 miles)	\$980,000
For completing do. from State Line to Catskill (90 miles)	6,675,000
Total	—————\$7,655,000

MIDDLE DIVISION, 163 MILES.

For Graduation, Bridges, and Superstructure	\$10,106,000
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WESTERN DIVISION, 147 MILES.

For Graduation, Bridges, and Superstructure	\$8,452,500
Grand total	<u>\$26,213,500</u>

Total distance, 420 miles.

Average per mile, \$62,413.19.

The foregoing estimate exceeds by about three millions of dollars the amount that would be required for a road with bridges,

rails and substructure of the kind chiefly used by the New York Central and Hudson River Railroad.

In consequence of the rapid increase of the traffic over the several lines of railroad between New York and Buffalo, and the urgent commercial demand for increased and better facilities for its accommodation, and as a measure of practical economy, I would recommend the construction of the Eastern and Western Divisions of your road, before commencing the work of the Middle Division.

My reasons for this are, that a connection can be made with the Rondout and Oswego, and the New York, Midland and Oswego Railroads, on terms *pro rata*, that will secure to you a through line to Buffalo, and a saving of an immediate outlay of ten millions of dollars.

The Middle Division can then be constructed at your convenience, and with the economy that time and the use of the completed portions of your road will afford.

I would not wish you to infer that the deferred Division is of less value to your line than the others; on the contrary, it is a *very important* portion of your route. Over it you secure the low grades across the mountain range, and the extensive connections with Northern New York and Canada, and the very valuable local traffic that this portion of the line will control.

I have sought in this report to present to your Board authentic data and statistics from official sources only, and in a concise form, from which the great value of your road will be seen; avoiding details, and innumerable deductions that might properly have been drawn from them.

A brief statement of the advantages secured by the New York, West Shore and Chicago Railroad is—

1st. *A saving in distance* between New York and Buffalo, over the New York Central and Hudson River Railroad, of *twenty-four miles*.

2d. It passes through sections of country abounding in the best material required in construction, thereby materially lessening its cost.

3d. Lighter grades; construction from the best material, with all the modern improvements in superstructure and rolling stock, and adaptation to greater speed, than on any existing railway in this country.

4th. The Eastern terminus commands twenty-two miles of frontage on the harbor of New York, free from ice in the winter, land sheltered from storms, and affording facilities for the trans-shipment of goods, unapproached by any other locality.

5th. The road is recognized and demanded, as a pressing commercial necessity, by commercial men throughout the East and the West, and along its route.

Respectfully,

CHARLES B. STUART,

Engineer-in-Chief.

APPENDIX.

The magnitude of your enterprise will naturally lead capitalists to inquire as to its probable future ; therefore as an additional evidence which would seem to place the success of this great work beyond a doubt, I present you with a tabular statement of the workings of the New York Central Railroad—the road that now has a virtual monopoly of the local as well as the through traffic on the line and through the section of country over which your road is to run.

The statement here made is from an official source, and when we take into consideration the vast and rapid increase of business from Buffalo East over the line adopted for the construction of your road, and the fact that the present roads have (in addition to paying the interest on their large bonded debts, and providing a sinking fund for the redemption of the principal of their bonds) paid more in dividends than the entire cost of their roads, it can scarcely be questioned, with the shorter line, lighter curves and grades, the importance of your Eastern terminus and the many other superior advantages your line will possess over the present constructed lines, that once completed it will be quite as remunerative as any of the great trunk lines now in operation, as I think a careful perusal of the following tables will demonstrate.

(See *Italics* on page 24.)

The importance of constructing a first-class road in the beginning, can be readily seen by reference to the following table, derived from official sources, showing that the New York Central Railroad has expended \$25,459,413 for maintenance of way within the period of eight years. On a first-class structure this expense shall not exceed one-third the above sum.

COST OF MAINTENANCE OF ROAD-BED AND IRON N. Y. CENTRAL, 8 YEARS PAST :

1862.....	\$1,709,711
1863.....	2,132,342
1864.....	3,170,750
1865.....	4,062,406
1866.....	3,636,603
1867.....	3,558,143
1868.....	3,650,944
1869.....	3,538,514
	<hr/>
	\$25,459,413

NEW YORK CENTRAL RAILROAD.

CAPITAL STOCK, FUNDED DEBT, AND COST OF ROAD AND EQUIPMENT FROM
1854 TO 1870.

Years.	Capital Stock.	Funded Debt.	Cost of Road and Equipment.	Length of Road.	Double Track, including Sidings.
1854	\$23,067,415	\$14,462,742	\$25,907,374	298	
1855	24,154,860	14,462,742	28,523,913		306
1856	24,136,660	14,763,897	29,786,372		312
1857	24,136,600	14,631,573	30,515,815		
1858	24,182,400	14,404,467	30,732,517		
§ 1859	24,000,000	14,333,771	30,840,713		
1860	24,000,000	14,332,523	31,106,094		
1861	24,000,000	14,613,505	31,524,226		
1862	24,000,000	14,279,593	31,787,398		
1863	24,209,000	13,779,648	32,740,068		
1864	24,386,000	13,211,342	32,879,251		
1865	24,591,000	14,627,443	33,701,920		
1866	25,801,000	14,095,804	34,133,911		432
1867	28,537,000	12,069,820	36,594,405		
1868	28,780,000	11,458,904	36,607,697		459
1869	28,795,000	11,398,425	37,603,696		468
† 1870	89,428,330	13,681,897		442	638

† Capital Stock, \$45,000,000; Consolidated Certificates, \$44,428,330.

§ \$182,400 unpaid Capital Stock Lewiston R. R. Co. retired.

GROSS EARNINGS, NET EARNINGS, DIVIDENDS AND SURPLUS IN EACH YEAR.
FROM 1854 TO 1870.

Year.	Gross Earnings.	Net Earnings.	Dividends Paid.	Surplus.
1854	\$5,918,334	\$3,306,272	\$2,114,953	\$178,928
1855	6,563,518	3,162,126	1,919,484	1,242,642
1856	7,707,348	3,609,481	1,919,564	658,445
1857	8,027,251	3,573,736	1,919,564	629,962
1858	6,528,412	3,041,120	1,919,564	113,154
1859	6,200,848	2,851,737	1,679,782	141,570
1860	6,957,241	2,678,401	1,440,000	195,129
1861	7,309,042	2,661,065	1,440,000	159,086
1862	9,356,827	3,749,077	1,440,000	1,227,884
1863	10,897,631	4,054,998	1,730,000	1,154,799
1864	12,997,889	3,651,706	2,279,173	89,625
1865	13,975,524	3,093,166	1,542,933	66,430
1866	14,596,785	3,583,345	1,552,383	486,631
1867	13,979,514	3,325,822	1,734,831	319,908
1868	14,381,303	5,143,140	2,110,248	1,903,077
1869	15,586,616	6,353,710	4,353,804	1,115,175
* 1870	22,363,319	8,068,265	6,863,241	111,183
	\$186,134,922	\$65,627,182	\$37,959,624	\$9,793,628

* Consolidated with the Hudson River Railroad.



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